### Abstract

The study of orientation selectivity in the primary visual cortex V1 is one of the fundamental findings in mammals. Orientation selectivity refers to the ability of neurons to preferentially respond to specific orientations of visual stimuli, such as bars or gratings. The orientation selective neurons can either be in columnar organization (humans) or in salt and pepper organization, as is the case for mice. In other words, selective neurons are intermingled in the mice V1 and do not follow a systematic structure. Yet, the mechanisms underlying the orientation selectivity structure in rodents are yet to be studied. The current project aimed to investigate the ‘salt and pepper’ architecture arguing that selective neurons are intermingled in the mice V1. In this project we studied 20,000+ neural responses of a population of neurons from V1 of mice for a static grating that is rotating randomly between 0-360 degrees. Using this data, various models and statistical analysis were conducted to measure the accuracy of our findings. Via a mildly complex model, the orientation selectivity of neurons was proven. We generated tuning curves which were then fitted using the Von-mises model, sine wave, Gaussian mixture model, and artificial neural network (ANN). Employing the best fitting model, we calculated the Orientation Selectivity Index (OSI) which was verified by applying statistical analysis. Then, utilizing the spatial autocorrelation model, we developed an orientation map of the neurons based on their provided spatial coordinates. Accordingly, we verified that 17.46% of neurons show high OSI, 62.65% responded equally to different orientations, and 19.89% show cross-orientation inhibition.